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**CASE  
FILE  
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INTERAGENCY REPORT: ASTROGEOLOGY 10  
A TEST OF COURT-STENOGRAPHIC TECHNIQUES FOR  
RECORDING GEOLOGIC DESCRIPTIONS

**CASE FILE  
COPY**

By David Schleicher

November 1968

This report is preliminary and has not  
been edited or reviewed for conformity  
with U.S. Geological Survey standards  
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Prepared by the Geological Survey for the  
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Administration

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A TEST OF COURT-STENOGRAPHIC TECHNIQUES  
FOR RECORDING GEOLOGIC DESCRIPTIONS

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ABSTRACT

Court-stenographic techniques offer a means for making a typed transcript of oral comments with very little delay; they may thus prove useful for immediate study of geologic descriptions transmitted by astronauts exploring the Moon. A test was held to evaluate this possibility. One court reporter transcribed oral geologic descriptions on a shorthand typewriter (stenograph), and a second reporter translated the stenographic notes into a typed transcript. For the entire test, the average observed lag between the time a word was spoken and the time it was typed was about 72 seconds, and serious errors affected fewer than 4 percent of the words spoken in the test. No other technique tested has produced so accurate a transcript so promptly.

INTRODUCTION

An earth-based data-reduction center has been proposed (Schleicher and Goldberg, 1967) to record and study geologic descriptions radioed by astronauts from the Moon. A quick and intensive study of such descriptions is far more easily made from a written transcript than from the radio transmission or a magnetic recording of it.

There has been a problem in finding a technique for quickly making an accurate written transcript that is intelligible to laymen. In practice, two operations must be performed simultaneously, the first recording each word (either magnetically or by some form of shorthand) as it is spoken, and the second, in turn, transcribing this immediate but hard-to-use record into printed English. Two techniques have been tried unsatisfactorily: typing directly from an audio tape and typing from a stenographer's manually written shorthand.

An untried technique that appeared promising was immediate transcription and typing of the stenographic notes made by a

court reporter from oral descriptions. This report discusses the procedures and results of a brief test of this technique held on 18 April 1968. The aims of this test were to see 1) how quickly a written transcript could be made by this technique, 2) how accurate the transcript would be, and 3) how to use such a transcript most effectively during lunar geologic exploration.

#### TEST PROCEDURE

For the test, parts of a magnetic tape were selected from a previous exercise, in which a field man had radioed geologic observations to a data center. Two court reporters transcribed the oral observations; one transcribed them verbatim on the stenograph (shorthand typewriter), and the other translated the notes as they emerged from the stenograph and typed them.

#### TEST CONDITIONS

There were two kinds of field observations (see table 1); the field man used a checklist for both: (1) description of lithologic units and (2) answers to specific questions formulated from aerial photographs of the field area and bearing on its geologic history (for example, "Do the craters have ejecta?").

Two voices were heard on the audio tape: dominantly that of the field man (Bob), and very subordinately that of a communicator (Dave) in the data center, who spoke, on the average, more than twice as fast as the field man (see table 2).

The court reporters were given a list of terms likely to be used during the test, in order to acquaint them with geologic terminology. No attempt was made to include all unfamiliar terms, because the reporters' treatment of such terms was one of the test variables. The reporters had had no previous practice in reading one another's stenographic notes, so before the test, they practiced transcribing parts of the audio tape that were used later. Because the tape was made from radio transmissions, parts were noisy, and some words and phrases were unintelligible.

To simplify paper-handling, a 12-inch-wide roll of paper

Table 1.--Representative excerpts reproduced from test transcript. Errors in the transcript are bracketed; corrections and omissions are indicated by braces

TRVERSE I

DBOB: Okay, Dave. I will start then with composition of brim material.

DAVE: Very good.

BOB: The rim material surrounding this crater can be divided in to two <sup>*{lithologies The predominant}*</sup> ~~major~~ major

litiology seems to be basaltic cinders composing about fifty per cent of therim material.

These basaltic sinders have a <sup>*{predominant}*</sup> color of dark gray.

The common mode of <sup>*{size}*</sup> [five] I would say is less than five [-- than five] millimeters diameter.

The uncommon mode would be basaltic cinders greater than one centimeter, between one and two centimeters in diameter.

The other noticable lithology represented in the rim is brown clay, comprising about forty per cent of the rim material.

I am going <sup>*{to give now}*</sup> [to] now a more detailed description of basaltic cinders. The cinders <sup>*{--}*</sup> do you think I should give more [order and] size, Dave? I am interrupting here.

DAVE: A more what <sup>*{into}*</sup> size, Bob?

BOB: Should I break down what I have a lady said about size, more [in] detail or do you think this is sufficient <sup>*{?}*</sup>?

Table 1.--Representative excerpts reproduced from test transcript. Errors in the transcript are bracketed; corrections and omissions are indicated by braces--Continued

DAVE: ( ~~max~~ ) Ebo seems to think it's all right, B ob.

BOB: Okay, the basaltic cinders are vicicular and angular with textures predominantly aphanitic but some cinders are glassy in texture.

The vesiculs [also] have sizes <sup>generally</sup> less than one millimeter in diameter.

#### TRAVERSE II

4

I am [a] at location Delta ten <sup>1,3</sup>fourteen five, at the west edge of a small double <sub>rim</sub> crater. There is a raised outer rim.

Slope of the inner rim is approximately three degrees inward.

No circumferential fractures noticed. There is no inversion of rim strata noticed.

The rim material does seem to be ejecta from the crater.

No meteoritic material is noticed and no shock metamorphic material is seen.

No explosive devices or mine artifacts are seen.

I am going to move directly north to another crater.



Table 2.--Representative speech rates, computed as normalized 5-character "words" per minute (uninterrupted radio transmissions)

	Traverse I			Traverse II		
	Avg (total "words"/total min)	Max	Min	Avg (total "words"/total min)	Max	Min
Field man---	90 (450/5.0)	138	51	108 (182/1.7)	140	89
Communicator---	229 (137/0.60)	258	192	220 (62/0.28)	272	208

How data were computed:

- 1) Representative uninterrupted descriptions picked from transcript.
- 2) "Words" counted from corrected transcript and totaled ("words" = strokes in typed line divided by 5--standard stenographic practice).
- 3) Times gotten from audio tape with stopwatch to nearest second and totaled.
- 4) Total "words" divided by total time.

was fed through a typewriter with a stationary carriage. The typed transcript was double-spaced, and an 8-inch (95-stroke) line was used. The typewriter space bar did not work properly during the test.

#### RESULTS AND ANALYSIS

The test produced a typed transcript of approximately 2,100\* words on a continuous roll of paper about 6 feet long. The results are analyzed in tables 3 and 4, and representative excerpts from the transcript are reproduced in table 1.

Since this test was intended only to evaluate the general feasibility of court-stenographic techniques for prompt transcribing, there was no attempt to collect enough data for a rigorous statistical analysis of the test activities. And since the test was to evaluate the overall transcribing technique, the activities of the two court reporters were not analyzed separately. The results discussed below, then, show approximately how well this technique can work. There are no statistical data that would enable comparison of these results with those of previous exercises using other transcribing techniques. But no previous technique has produced results so readily usable nearly so promptly.

#### Time Lags

The average observed lag between the time a word was spoken and the time it was typed was 69 seconds for the first traverse and 79 seconds for the second. The maximum observed lag was 95 seconds, and the minimum, 45 seconds, which is roughly the time needed for the stenograph tape to emerge from the stenograph machine and become visible to the typist. The average lag for the entire test was 72 seconds.

The greater average lag in the second part of the test may

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\*This is a count of the total number of words actually spoken during the test.

Table 3.--Observed time lags (arranged in sequence) versus number of practice runs, showing speech rate (5-character "words" per minute) and percentage of errors corresponding to each lag.

	Traverse I										Traverse II																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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	730---	731---	732---	733---	734---	735---	736---	737---	738---	739---	740---	741---	742---	743---	744---	745---	746---	747---	748---	749---	750---	751---	752---	753---	754---	755---	756---	757---	758---	759---	760---	761---	762---	763---	764---	765---	766---	767---	768---	769---	770---	771---	772---	773---	774---	775---	776---	777---	778---	779---	780---	781---	782---	783---	784---	785---	786---	787---	788---	789---	790---	791---	792---	793---	794---	795---	796---	797---	798---	799---	800---	801---	802---	803---	804---	805---	806---	807---	808---	809---	810---	811---	812---	813---	814---	815---	816---	817---	818---	819---	820---	821---	822---	823---	824---	825---	826---	827---	828---	829---	830---	831---	832---	833---	834---	835---	836---	837---	838---	839---	840---	841---	842---	843---	844---	845---	846---	847---	848---	849---	850---	851---	852---	853---	854---	855---	856---	857---	858---	859---	860---	861---	862---	863---	864---	865---	866---	867---	868---	869---	870---	871---	872---	873---	874---	875---	876---	877---	878---	879---	880---	881---	882---	883---	884---	885---	886---	887---	888---	889---	890---	891---	892---	893---	894---	895---	896---	897---	898---	899---	900---	901---	902---	903---	904---	905---	906---	907---	908---	909---	910---	911---	912---	913---	914---	915---	916---	917---	918---	919---	920---	921---	922---	923---	924---	925---	926---	927---	928---	929---	930---	931---	932---	933---	934---	935---	936---	937---	938---	939---	940---	941---	942---	943---	944---	945---	946---	947---	948---	949---	950---	951---	952---	953---	954---	955---	956---	957---	958---	959---	960---	961---	962---	963---	964---	965---	966---	967---	968---	969---	970---	971---	972---	973---	974---	975---	976---	977---	978---	979---	980---	981---	982---	983---	984---	985---	986---	987---	988---	989---	990---	991---	992---	993---	994---	995---	996---	997---	998---	999---	1000---	1001---	1002---	1003---	1004---	1005---	1006---	1007---	1008---	1009---	1010---	1011---	1012---	1013---	1014---	1015---	1016---	1017---	1018---	1019---	1020---	1021---	1022---	1023---	1024---	1025---	1026---	1027---	1028---	1029---	1030---	1031---	1032---	1033---	1034---	1035---	1036---	1037---	1038---	1039---	1040---	1041---	1042---	1043---	1044---	1045---	1046---	1047---	1048---	1049---	1050---	1051---	1052---	1053---	1054---	1055---	1056---	1057---	1058---	1059---	1060---	1061---	1062---	1063---	1064---	1065---	1066---	1067---	1068---	1069---	1070---	1071---	1072---	1073---	1074---	1075---	1076---	1077---	1078---	1079---	1080---	1081---	1082---	1083---	1084---	1085---	1086---	1087---	1088---	1089---	1090---	1091---	1092---	1093---	1094---	1095---	1096---	1097---	1098---	1099---	1100---	1101---	1102---	1103---	1104---	1105---	1106---	1107---	1108---	1109---	1110---	1111---	1112---	1113---	1114---	1115---	1116---	1117---	1118---	1119---	1120---	1121---	1122---	1123---	1124---	1125---	1126---	1127---	1128---	1129---	1130---	1131---	1132---	1133---	1134---	1135---	1136---	1137---	1138---	1139---	1140---	1141---	1142---	1143---	1144---	1145---	1146---	1147---	1148---	1149---	1150---	1151---	1152---	1153---	1154---	1155---	1156---	1157---	1158---	1159---	1160---	1161---	1162---	1163---	1164---	1165---	1166---	1167---	1168---	1169---	1170---	1171---	1172---	1173---	1174---	1175---	1176---	1177---	1178---	1179---	1180---	1181---	1182---	1183---	1184---	1185---	1186---	1187---	1188---	1189---	1190---	1191---	1192---	1193---	1194---	1195---	1196---	1197---	1198---	1199---	1200---	1201---	1202---	1203---	1204---	1205---	1206---	1207---	1208---	1209---	1210---	1211---	1212---	1213---	1214---	1215---	1216---	1217---	1218---	1219---	1220---	1221---	1222---	1223---	1224---	1225---	1226---	1227---	1228---	1229---	1230---	1231---	1232---	1233---	1234---	1235---	1236---	1237---	1238---	1239---	1240---	1241---	1242---	1243---	1244---	1245---	1246---	1247---	1248---	1249---	1250---	1251---	1252---	1253---	1254---	1255---	1256---	1257---	1258---	1259---	1260---	1261---	1262---	1263---	1264---	1265---	1266---	1267---	1268---	1269---	1270---	1271---	1272---	1273---	1274---	1275---	1276---	1277---	1278---	1279---	1280---	1281---	1282---	1283---	1284---	1285---	1286---	1287---	1288---	1289---	1290---	1291---	1292---	1293---	1294---	1295---	1296---	1297---	1298---	1299---	1300---	1301---	1302---	1303---	1304---	1305---	1306---	1307---	1308---	1309---	1310---	1311---	1312---	1313---	1314---	1315---	1316---	1317---	1318---	1319---	1320---	1321---	1322---	1323---	1324---	1325---	1326---	1327---	1328---	1329---	1330---	1331---	1332---	1333---	1334---	1335---	1336---	1337---	1338---	1339---	1340---	1341---	1342---	1343---	1344---	1345---	1346---	1347---	1348---	1349---	1350---	1351---	1352---	1353---	1354---	1355---	1356---	1357---	1358---	1359---	1360---	1361---	1362---	1363---	1364---	1365---	1366---	1367---	1368---	1369---	1370---	1371---	1372---	1373---	1374---	1375---	1376---	1377---	1378---	1379---	1380---	1381---	1382---	1383---	1384---	1385---	1386---	1387---	1388---	1389---	1390---	1391---	1392---	1393---	1394---	1395---	1396---	1397---	1398---	1399---	1400---	1401---	1402---	1403---	1404---	1405---	1406---	1407---	1408---	1409---	1410---	1411---	1412---	1413---	1414---	1415---	1416---	1417---	1418---	1419---	1420---	1421---	1422---	1423---	1424---	1425---	1426---	1427---	1428---	1429---	1430---	1431---	1432---	1433---	1434---	1435---	1436---	1437---	1438---	1439---	1440---	1441---	1442---	1443---	1444---	1445---	1446---	1447---	1448---	1449---	1450---	1451---	1452---	1453---	1454---	1455---	1456---	1457---	1458---	1459---	1460---	1461---	1462---	1463---	1464---	1465---	1466---	1467---	1468---	1469---	1470---	1471---	1472---	1473---	1474---	1475---	1476---	1477---	1478---	1479---	1480---	1481---	1482---

\*All lags clocked with stopwatch during test.

Table 4.--Errors in typed transcript (for explanation, see text)

	<u>Overall traverse</u>		<u>TRAVERSE I*</u>		<u>Communicator</u>	
	<u>Total</u>	<u>"Serious"</u>	<u>Misinterpretable</u>	<u>Total</u>	<u>"Serious"</u>	<u>Misinterpretable</u>
Typographic	229	3	0	20	0	0
(Spacing)	(165)	0	0	(16)	0	0
Wrong words	35	11	5	3	2	1
Missed words	16	16	0	5	5	0
Omitted words	49	35	8	13	8	0
Added words	<u>8</u>	<u>3</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>0</u>
Total	337 (20%)	68 (4%)	14 (1%)	42 (34%)	16 (13%)	1 (1%)
<u>TRAVERSE II**</u>						
Typographic	61	2	0	11	1	0
(Spacing)	(40)	0	0	(4)	0	0
Wrong words	6	5	5	0	0	0
Missed words	8	0	0	0	0	0
Omitted words	2	1	1	1	1	1
Added words	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
	77 (17%)	8 (2%)	6 (1%)	12 (22%)	2 (4%)	1 (2%)
OVERALL TEST AVERAGE						
	337 + 77	68 + 8	14 + 6	*Overall: 1,650 words, 27 min.		
	<u>1,650 + 448</u>	<u>2,098</u>	<u>2,098</u>	Communicator: 125 words,		
	(20%)	(4%)	(1%)	36 sec.		
				**Overall: 448 words, 6.5 min.		
				Communicator: 55 words,		
				17 sec.		

result from the greater speech rate\* corresponding to the last two observed time lags (table 3), or it may show the effect of familiarization with the audio tape from the practice runs, which were made predominantly from the first traverse. (A single practice run had no significant effect on the average time lag for the first traverse, however; cf. average lags, table 3). Alternatively, it might be due to the slightly greater rate of data inflow\* (69 words per minute as opposed to 61 words per minute for the first traverse). The increase in lag is probably not due to fatigue: the lags of the first traverse show no clear trend that would suggest fatigue. The second traverse was transcribed immediately after a rest period, and it was much shorter and more straightforward.

There is a slight tendency for greater lags to be associated with greater rates of speech, but it is significant that the greatest speech rates do not correspond to the greatest lags: the first reporter did not allow himself to fall hopelessly behind because of a single particularly difficult description, but rather abandoned that description so as to catch those that followed. Longer descriptions are also weakly associated with greater lags, but the weakness of the correlation suggests that other factors more strongly affected the lag: e.g., the typist either was still busy with the previous description or was waiting for the stenograph tape to emerge from the machine. There is apparently no correlation between the length of the lag and the percentage of errors.

#### Errors

Errors in the transcript may have stemmed from several sources: (1) from poor or unintelligible audio on the magnetic tape; (2) from mistakes made by the first reporter in stenographically transcribing the oral descriptions; (3) from mistranslations

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\*"Speech rate" is calculated as 5-character words per minute during uninterrupted speech (cf. table 2), whereas "data inflow" is calculated as the number of actual words spoken during the entire traverse divided by the length of the traverse in minutes.

made by the second reporter owing to his unfamiliarity with the first reporter's stenographic notes; and (4) from routine typographic errors, aggravated, in this case, by machine malfunction.

The various types of errors are enumerated in table 4. The figures are only approximate; it was impractical to employ a completely consistent set of detailed rules for counting errors, because the overall usefulness of the transcript was of primary concern and because the errors were not strictly comparable--misconstrued words, for example, being far more serious than mis-spacings. "Typographic" errors include transposition of letters, mis-spacings, obvious misspellings, and gross punctuation errors (for example, "I am going tovi enow (to give now) a more detailed description . . . "); they do not include strike-overs. Because the space bar was malfunctioning, errors of spacing were also counted separately from other typographic errors. "Wrong" words were misconstrued words: " . . . a substantial (actually "subtle") suggestion of layering . . . ." "Missed" words were noted by stenographers: "Missed one statement by Bob. It was short." They did not note that they'd missed "omitted" words. "Added" words were those erroneously inserted into the transcript.

Many misspelled words could be easily recognized because they were spelled phonetically: "afinitic" for "aphanitic" and "vicicular" or "visicular" for "vesicular." Other mistranscribed words were relatively easily recognized by their context ("Novo" for "Bravo"--letter "B" in the military phonetic alphabet: " . . . my location being . . . Novo two, fifteen ate."; or even "crotology" for "lithology": "The predominant crotology seems to be basaltic cinders.").

Because the only serious errors were those leading to ambiguities that could not be easily resolved, an attempt was made to enumerate "serious" errors, such as those shown above. The most serious errors of all are those that lead to wrong interpretations. These are primarily wrong words, e.g., "substantial" for "subtle" above. Both "serious" and "misinterpretable" errors are also presented in table 4.

The communicator spoke far less frequently than the field man (about one-tenth as many words--table 4) and much more rapidly (table 2); accordingly, the errors made in transcribing his speech were tabulated separately from those for the overall traverse. Both speed and infrequency probably contributed to the higher proportion of errors.

#### CONCLUSIONS

The court-stenographic techniques employed in this test appear to be potentially very useful for immediate study of geologic descriptions made during lunar missions. Even on this first trial, the transcript was accurate enough that there would be little need for revision: "serious" errors for the entire test average 4 percent, and errors leading to serious misinterpretations less than 1 percent. The maximum observed lag between the time a word was heard and the time it was typed was 95 seconds, and a representative average lag was about 72 seconds. Both speed and accuracy far exceeded those obtained in previous exercises with other transcribing techniques.

The court reporters suggested that several hours of practice together would increase their proficiency. They were not greatly hampered by unfamiliar terms; the terms they did mistranscribe were generally recognizable, and the reporters said that they could learn such terms without much trouble. A "spotter" versed in geologic terminology could help them with unfamiliar terms during traverses.

The typist had some difficulty understanding the first reporter's notes, but practice would eliminate this problem. Some typists are trained specifically to type from stenographic notes. The typist also had trouble reading the notes as they emerged from the stenograph, but this problem would be solved by using a device that displays the notes and advances them at a rate controlled by the typist. (In a later exercise, this device was successfully used.) A still more elaborate system might project the stenographic notes into a separate typing room. Modification of

the stenograph machine might reduce the time (roughly 45 seconds) needed for the stenograph tape to become visible to the typist. The reporters felt that they could work efficiently for a maximum of about an hour and a half. (The later exercise confirmed this estimate.) Double spacing made the transcript easy to read and moved the paper through the typewriter at a satisfactory rate without resulting in a transcript that was unwieldy because of its length.

The typist commonly tried to correct minor mistakes; if this habit is easily broken and if it is a cause of delay and(or) further inaccuracy, it should be discouraged. The best approach probably depends on the individual typist.

The higher percentage of errors made in transcribing the communicator's speech points up the need for practice between the reporters and all speakers. The communicator's speed would probably not have resulted in as many errors if the reporters had been more accustomed to his delivery.

The stenographic team could probably learn either to record all pauses, corrections, and changes of thought in mid-sentence, or to edit them out. Much here depends on how directly the speaker presents his data.

In court the reporters are accustomed to stopping the discussion momentarily if they fall behind. On missions, this will be impractical, but the geologic descriptions should be presented and acknowledged in such a way that no key information is lost.

For identification and filing, station numbers and times should be marked on the transcript during the traverse, ideally by some sort of automatic printer.

A magnetic-tape typewriter would facilitate revision of the transcript, if needed, during a traverse. The transcripts could be made available to the data-center team by television displays or, preferably, by remote typewriters wherever needed to provide copies for annotation and study. These remote typewriters would have to be fast enough to keep up with the typist and quiet



enough not to interfere with other activities in the data center. Accordion-folded "computer" paper would probably be most convenient to work with.

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#### REFERENCE

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